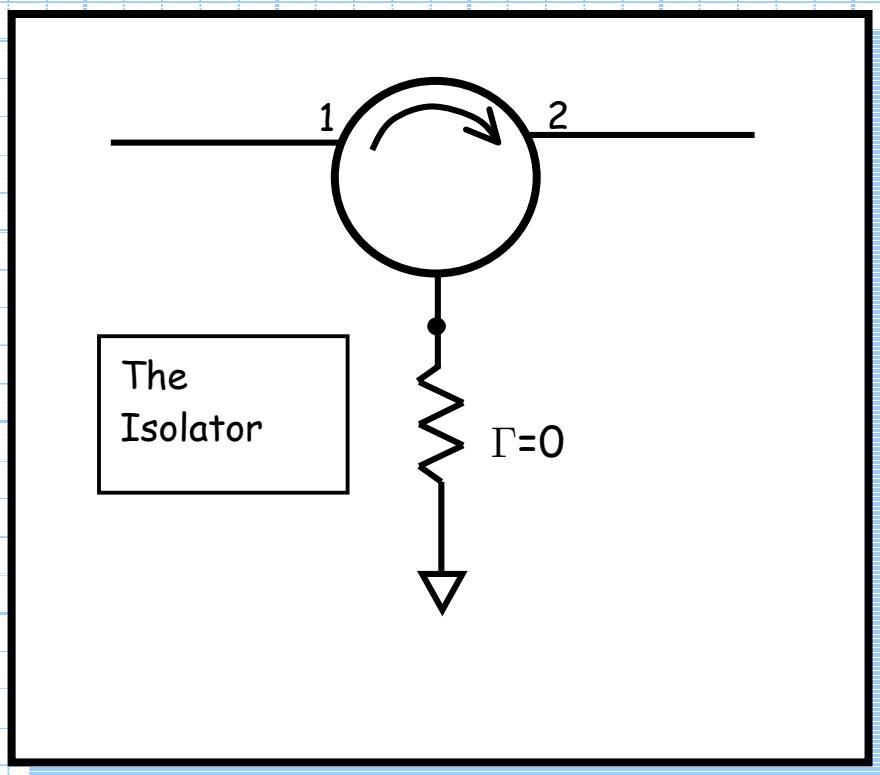
Isolators

An isolator is simply a circulator, port 3 terminated in a matched load!



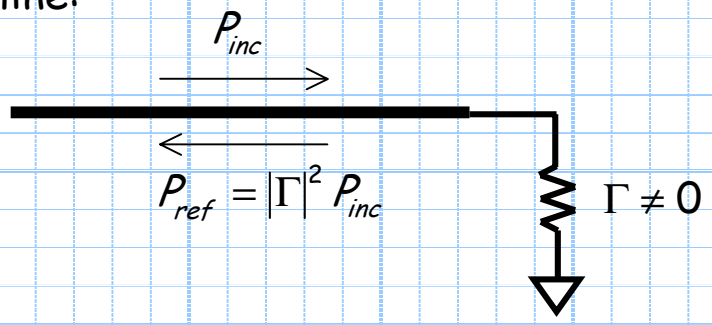
The matched load at port 3 insures that $P_3^+ = 0$ always. As a result we know that $P_1^- = P_3^+ = 0$ always!

An ideal isolator is thus a **two-port** device with an odd looking scattering matrix:

$$\bar{\bar{S}} = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$$

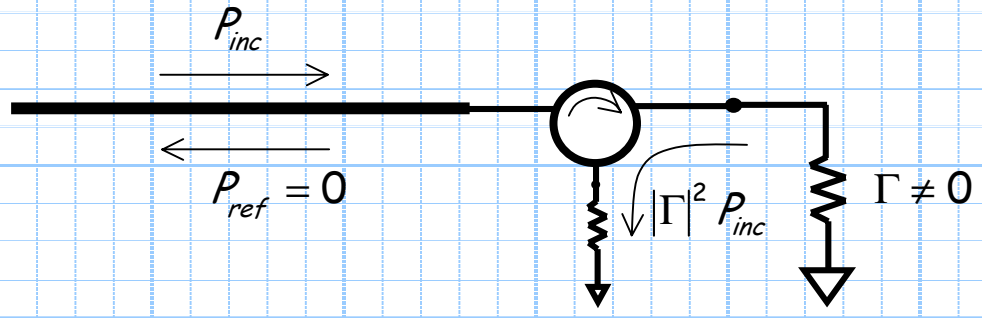
Therefore, $P_2^- = P_1^+$, but $P_1^- = 0$ regardless of P_2^+--an ideal isolator is matched, but **lossy**!

An isolator is useful for isolating a load from a source. For example, consider an unmatched load at the end of a transmission line:



Plenty of power is reflected back toward the source.

Now, let's insert an isolator between the source and load:



There is **no power** reflected back to the source! Instead, power reflected by the load is **absorbed** by the isolator.

To the source, the circuit appears **matched**—but its **not**!

If the isolator was truly a matching network, then the **absence** of reflected power would indicate that **all** the incident power was absorbed by the **load**. Instead, there is no reflected power because this power is instead absorbed by the **isolator**—the isolator is lossy!